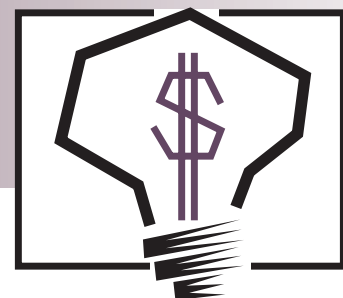


INVENTIONS & INNOVATION

Project Fact Sheet



COAL-FIRED AIR TURBINE (CAT)-CYCLE PLANT

COGENERATION PLANT INCREASES ENERGY EFFICIENCY OF COAL WITHOUT EXTRA COST

Benefits

- Significant energy savings gained from cogeneration rather than use of conventional energy generation processes
- Reduces capital costs compared to other cogeneration systems by using "off-the-shelf" components
- Does not cause corrosion like conventional coal-burning processes
- Uses coal or biomass rather than primary fuels such as oil or natural gas
- An environmentally attractive method of using domestically abundant fuels
- Emissions are minimized and treated economically

Applications

This technology applies to municipal power generation needs of all sizes, and is particularly adaptable to smaller generation plants of 150 megawatts or less. This technology could also be applied to the running of papermills.

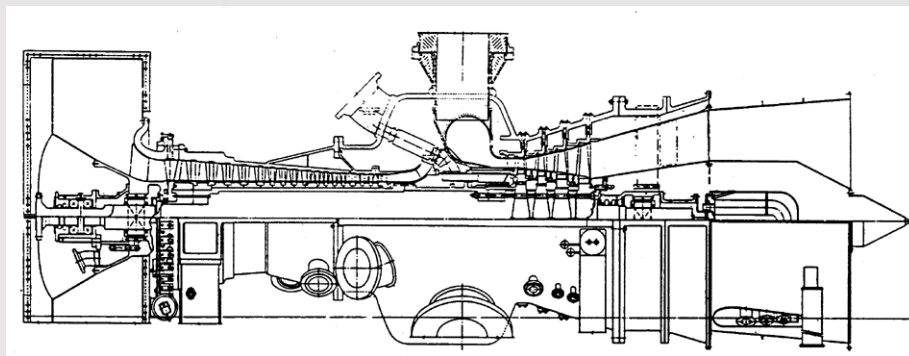
A number of cogeneration and steam-driven turbine systems for generating electricity were developed in the last two decades to improve energy efficiency and reduce pollution. However, these systems usually can't compete with the low cost of operating conventional oil- or natural gas-fired systems and they often require high capital investments for innovative equipment.

The coal-fired air turbine (CAT)-cycle plant circumvents these hurdles by combining up to 11 processes using readily available technology in an integrated system using a gas turbine. The energy efficiency of the CAT cycle can be more than 40%, while its capital and operating costs are less than competing systems. Moreover, the new plant uses domestically abundant coal, biomass, and other fuels, minimizing pollution through use of a circulating fluid bed combustion system.

Project Description

Goal: The current goal of this project is to bring CAT to commercial use. The immediate objective is the location of a user and the construction of an initial commercial plant. The initial plant is likely to be for cogeneration and to use biomass fuel.

CAT-CYCLE COAL-FIRED AIR TURBINE



A version of the CAT-cycle system for generating electricity using coal, compressed air, and steam, with lower capital investment costs than competing cogeneration systems.

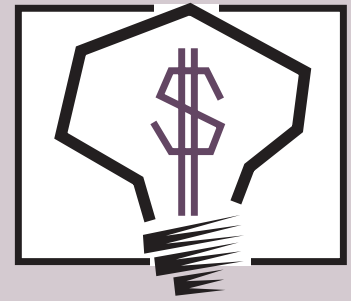


The system includes a gas turbine operating on clean air so it is called a "Coal Air Turbine" or CAT. As in all gas turbines, air is compressed, heated to increase its volume, and expanded in a turbine. The power produced by expanding the larger volume of hot air exceeds the power required to compress the cold air. The useful power is the excess of turbine power over compressor power. The air compressed in the gas turbine is heated in a heat exchanger by heat from combustion of the coal, coke, or biomass fuel. The fuel is mixed with a small quantity of crushed limestone and burned in a conventional circulating fluid bed (CFB). The fluidized granular stone heats the air heater. The gas turbine operates on clean heated air. Steam for cogeneration or for a steam turbine is raised by the exhaust of the gas turbine and CFB. Emissions are low as is normal for CFB combustion. The clean hot gas turbine exhaust air can be used for drying paper in a paper mill or for other process use or even for building heat.

R.W. Foster-Pegg, P.E., is negotiating and developing this new technology with the help of a grant funded by the Inventions and Innovation Program through the Department of Energy's Office of Industrial Technologies.

Progress and Milestones

A feasibility study, cost estimate, and evaluation of the CAT system were completed. The study concluded that a CAT would be more energy efficient with lower capital costs than present conventional plants. The study also found that CAT would be simple to construct and operate.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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